3.5. Geology and Soils

This section addresses potential geology and soil impacts that may result from construction and/or operation of the Belmont Village Encinitas-by-the-Sea Project. The following discussion addresses the existing conditions on the Project site, identifies applicable regulations, identifies and analyzes environmental impacts, and recommends measures to reduce or avoid adverse impacts anticipated from implementation of the Project, as applicable.

The analysis in this section is based on the Geotechnical Summary for Due Diligence prepared by Alta California (2018). The Geotechnical Summary for Due Diligence was peer reviewed by BRG Consulting Inc. The report and its attachments are included as Appendix F-1. Findings from the *Vibro Replacement Stone Columns Memo*, prepared by Hayward Baker, Inc (2018, Appendix F-2) are also included in this analysis.

Scoping Issues Addressed

During the scoping period for the Project, a scoping meeting was conducted, and written comments were received from agencies and the public. No comments were received regarding geology and soils.

3.5.1. Existing Conditions

Geologic Setting

Regional Geology

The Project site is located within the Peninsular Ranges Geomorphic Province. This geomorphic province extends from the Transverse Ranges and the Los Angeles Basin approximately 900 miles south to the southern tip of Baja California in Mexico. It varies in width from 30 to 100 miles. This province is characterized by mountainous terrain on the east composed mostly of Mesozoic igneous and metamorphic rocks, and relatively low-lying coastal terraces to the west underlain by late Cretaceous-age, Tertiary-age, and Quaternary-age sedimentary units. Most of coastal San Diego County is found on these coastal terraces and is underlain by sedimentary units (City of Encinitas, 2019a).

Site-Specific Geology

The Project site is underlain by Holocene- to late Pleistocene-age "young alluvial flood-plain deposits" that slope gently southward into the northern edge of the San Elijo Lagoon located to the south across Manchester Avenue. The Eocene-age sandstone bluffs composed of Torrey sandstone and Del Mar formations along the northern portions of the site and offsite are the sources for these sediments. The distribution of these geologic units is shown on Figure 3.5-1. Very minor prisms of artificial fill associated with agricultural practices occur throughout the site. Landslides and active

faulting are not known to occur within the Project site. Both are discussed in more detail later in this section. Groundwater was encountered during subsurface investigation at 9 to 26.5 feet below ground surface (bgs) (Alta California, 2018, Appendix F-1).

Seismic and Geologic Hazards

Several new faults developed in southern California during the Pliocene era. These created a new tectonic regime superposed on the flat-lying section of Tertiary and late Cretaceous rocks in the San Diego region. In southernmost California the principal known onshore faults are the San Andreas, San Jacinto, Elsinore, Imperial, and Rose Canyon faults. Collectively, these faults transfer most of this deformation. The offshore zone of faults that include the Coronado Bank, Descanso, San Diego Trough, and San Clemente faults off the San Diego and northern Baja California coastline take the balance of the plate margin slip. Most of the offshore faults come together south of the U.S.- Mexico border, where they come onshore as the Agua Blanca fault, which transects the Baja California peninsula (City of Encinitas, 2019a).

Active Faults

A fault is defined as is a shear or zone of closely associated shears across which earth materials on one side have been displaced with respect to those on the other side. This displacement is a result of tectonic forces. A fault can be distinguished from those fractures or shears caused by landslides or other gravity-driven surficial failures. A fault whose age of most recent movement is not known or is unconstrained by dating methods or by limitations in stratigraphic resolution is commonly referred to as an age-undetermined fault. A fault that has had surface displacement within Holocene time is known as a Holocene-active fault. A fault whose recency of past movement is older than 11,700 years, and thus does not meet the criteria of Holocene-active fault is a pre-Holocene fault. This is as defined in the State of California's Mining and Geology Board regulations. An Earthquake Fault Zone is a regulatory zone (also known as A-P Zones) that encompass traces of Holocene-active faults to address hazards associated with surface fault rupture. Earthquake Fault Zones are delineated by the California State Geologist and implemented by lead agencies through permitting, inspection and land-use planning activities (Department of Conservation, 2018).

Based on a review of the U.S. Geological Survey (USGS) quarternary fault mapping program (USGS, 2019) there are no known active or potentially active faults that transect or project toward the project site. In addition, the Project site is not located within an earthquake fault zone mapped by the State or by the County of San Diego.

Seismicity

The primary earthquake effect that produces the vast majority of damage is ground shaking. There are several factors that control the interaction of ground motion with structures. This makes ground shaking hazards difficult to predict. Earthquakes, or landslides induced by earthquake activity, can cause damage regardless of proximity to fault lines. Significant economic loss can result from

damage to public and private structures and infrastructure which can also threaten public health and safety. Ground shaking is the most commonly felt effect of earthquakes that has the potential to adversely affects humans and infrastructure. During earthquakes, seismic waves are propagated through the earth's crust. This results in the ground vibrations normally felt during an earthquake. Depending on the frequency content of the earthquake rupture mechanism and the path and material through which the waves are propagated, seismic waves can vibrate in all directions and at a variety of frequencies. The earthquake rupture mechanism is the distance from the earthquake source, or epicenter, to an affected site (City of Encinitas, 2019a).

Six different Seismic Design Categories, based on building occupancy type and the severity of the potential ground motion from an earthquake at the site, are defined by the California Building Code (CBC). The six Seismic Design Categories are designated A through F. Category A has the lowest seismic potential and Category F has the greatest seismic potential. All of San Diego County, including the Project site, is in Seismic Design Category E or F. Therefore, buildings on the Project site must comply with the specifications for Categories E and F (City of Encinitas, 2019a).

The Rose Canyon Fault lies offshore (2.5 miles west of the City of Encinitas at its closest point) and has the capability to generate a magnitude 6.2 to 7.2 earthquake that could potentially damage public and private structures and infrastructure throughout the city. A magnitude 6.9 earthquake on the Rose Canyon Fault has the potential to reach a peak ground acceleration of .40 within downtown Encinitas and the Coast Highway 101 corridor. These sections of the city are more likely to suffer greater damage to infrastructure and human life than other parts of the city due to the following factors:

- Presence of older buildings,
- Relatively higher population density and
- Softer soils susceptible to liquefaction, lurch cracking, lateral spreading and local subsidence.

The Rose Canyon Fault has a citywide extent. As a result, there is a greater percentage of the city's population that is potentially exposed to this hazard relative to others, and comparatively, potential losses from an earthquake would be larger than in most cases (County of San Diego, 2019).

Secondary Seismic Hazards

Liquefaction, Dynamic Settlement, and Lateral Spread

Seismic agitation of relatively loose saturated sands, silty sands, and some silts have the potential to result in an increase in pore pressure. A temporary quick condition known as liquefaction can occur if the pore pressure exceeds the overburden stresses. Generally speaking, more recent sediment deposits are more likely to be susceptible to liquefaction. Other factors that need to be considered when discussing liquefaction include:

- Groundwater;
- Confining stresses;
- Relative density; and

Intensity and duration of seismically-induced ground shaking.

The effect of liquefaction can manifest in several ways including: 1) loss of bearing; 2) lateral spread; 3) dynamic settlement; and 4) flow failure. Among these, the most damaging form of failure has typically been lateral spread (Alta California, 2018, Appendix F-1).

Landslides

There are several formations in the San Diego region which are prone to landslides. Generally, these formations have high clay content and mobilize when they become saturated with water. There are other factors, such as steeply dipping bedding, that projects out of the face of the slope and/or the presence of fracture planes, that could also increase the potential for landslides (City of Encinitas 2019a). However, according to the Geotechnical Report prepared for the Project, landslides and active faulting are not known to occur on the Project site (Alta California, 2018, Appendix F-1).

Paleontological Resources

Paleontological resources are the fossiliferous remains or traces of prehistoric plant and animal life that are not connected with human cultural resources (Deméré and Walsh, 2003). Paleontological resources (such as bones, teeth, shells, and wood) are found in geologic deposits within which they were originally buried and can provide a historic record of environmental conditions outside of human influence, depending on the age and characteristics of the formation. These resources represent a limited, nonrenewable, and sensitive scientific and education resource.

A variety of studies have been completed to characterize geologic formations and their potential for containing paleontological resources. This analysis relies on Paleontological Resources, San Diego County California, prepared by Thomas Deméré, PhD, and Stephen Walsh (Deméré and Walsh, 2003), to identify the potential for resources in the study). Based on past studies and findings throughout the San Diego region, local geologic formations have been assigned paleontological resource sensitivity, indicating their potential to contain paleontological resources of scientific importance. Resources could be disturbed as part of excavation activities, which are proposed for specific areas within the Project site.

Due to the relationship between fossils and geologic formations in which they can occur, the geology of an area provides a reasonable basis for predicting the potential for the presence of paleontological resources. As shown on Figure 3.5-1, terraces and slopes within the Project site are underlain by Delmar and Torrey sandstone formations (Td and Tt), topped by sediment classified as alluvium and colluvium (Qal).

Paleontological Resources, San Diego County California (Deméré and Walsh, 2003) provides generalized potential sensitivity for different geologic deposits within San Diego County. The proposed Project is located within the Coastal Plain region of the Peninsular Ranges Province. The Coastal Plain region is underlain by a "layer cake" sequence of marine and nonmarine sedimentary rock units that record portions of the last 140 million years of earth history. Over this period of time, the relationship of land and sea has fluctuated drastically such that today we have ancient marine rocks preserved up to elevations of around 900 feet above sea level and ancient river deposits as high as 1,200 feet. Faulting related to the local La Nación and Rose Canyon fault zones has broken up this sedimentary sequence into a number of distinct fault blocks in the southwestern part of San Diego County, while in the northern area the effects of faulting are not as great and the rock units are relatively undeformed (Deméré and Walsh, 2003). Descriptions of specific formations found within the Project site are summarized below in Table 3.5-1.

TABLE 3.5-1. PALEONTOLOGICAL FORMATION CHARACTERISTICS AND SENSITIVITY

Formation	Characteristics	Sensitivity
Later Quaternary Alluvium	Alluvial sediments of relatively recent age (i.e., generally younger than 10,000 years old). Consists of poorly consolidated clays, silts, sands, and gravels generally laid down by ephemeral streams.	Low
Delmar	Consists of greenish silty mudstones, brown siltstones, and greenish sandstones deposited in a lagoonal/estuarine setting. This formation supports well-preserved to poorly preserved remains of estuarine invertebrates and estuarine vertebrates.	High
Torrey Sandstone	Consists primarily of yellowish-white, coarse-grained, locally cross-bedded, arkosic sandstones deposited in an ancient nearshore marine environment. This formation has produced important remains of fossil plants and marine invertebrates.	Moderate

Source: Deméré and Walsh 2003.

3.5.2. Regulatory Framework

Federal

International Building Code

The International Building Code (IBC) is a model building code developed by the International Code Council and provides the basis for the California Building Code (CBC) which is discussed below. The IBC includes minimum standards for building construction to ensure human health and safety. Prior to the creation of the IBC, a variety of building codes were used. By the year 2000, these previous codes had been replaced by the IBC. Updates to the IBC are provided every 3 years (City of Encinitas, 2019a).

Occupational Safety and Health Administration Regulations

The Occupational Safety and Health Administration (OSHA) Excavation and Trenching Standard (29 CFR, Part 1926(P) et seq.) covers requirements for excavation and trenching operations. Excavation and trenching are among the most hazardous construction activities. OSHA requires that all excavations where employees could potentially be exposed to cave-ins, be protected by

- Sloping or benching the sides of the excavation,
- Supporting the sides of the excavation, or
- Placing a shield between the side of the excavation and the work area (City of Encinitas, 2019a).

State

California Building Code

As discussed above, the design standards in the CBC are largely based on the IBC. However, due to the geological conditions in California, the CBC includes the addition of more specific design provisions for structures located in seismic zones. The provisions of the CBC apply throughout the state to the construction, alteration, movement, replacement, and/or demolition of all buildings and structures or any appurtenances connected or attached to such buildings or structures (City of Encinitas, 2019a).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. Passed by the California Legislature in 1990, this law was codified in the Public Resources Code (PRC) as Division 2, Chapter 7.8A and became operative in April 1991. The act resulted in a mapping program that is intended to reflect areas with the potential for liquefaction, landslide, strong ground shaking, or other earthquake and geologic hazards. The Project site does not have an official seismic-hazard zone map (City of Encinitas, 2019a).

Alquist-Priolo Earthquake Fault Zoning Act

As a result of the San Fernando earthquake which occurred in 1971, the California Legislature passed the Alquist-Priolo Earthquake Fault Zoning Act (PRC Section 2621 et seq.) in 1972. The Act provides a mechanism to reduce losses from surface fault ruptures throughout the state. Specifically, the Act requires that proposed developments that have tracts of four or more dwelling units investigate the potential for ground rupture in designated Alquist-Priolo zones. These zones serve as an official notification of the probability of ground rupture during earthquake events. Where designated Alquist-Priolo zones are found, no building may be constructed on the line of fault. In addition, before construction is allowed, a geologic study must be conducted to determine the location of all active fault lines within the Alquist-Priolo fault zones. In general, local agencies are

required to regulate development proposed in designated Alquist-Priolo fault zones (City of Encinitas, 2019a).

Paleontological Resources

California Environmental Quality Act (CEQA)

CEQA affords paleontological resources explicit protection, specifically in item V(c) of CEQA Guidelines Appendix G, the Environmental Checklist Form, which addresses the potential for adverse impacts to "unique paleontological resource[s] or site[s] or … unique geological feature[s]." This provision covers fossils of significant importance—remains of species or genera new to science, as well as localities that yield fossils significant in their abundance, diversity, preservation, and so forth.

In addition, CEQA provides that generally, a resource shall be considered "historically significant" if it has yielded or may be likely to yield information important in prehistory (PRC Section 15064.5[a][3][D]). Paleontological resources would fall within this category. Sections 5097.5 and 30244 of PRC Chapter 1.7 also defined unauthorized removal of fossil resources as a misdemeanor and require mitigation of disturbed sites.

Paleontological resources are classified as nonrenewable scientific resources and are protected by state statute (PRC Section 5097.5). However, neither state nor local agencies have specific jurisdiction over paleontological resources, but all must evaluate potential impacts and provide any applicable mitigation measures. State and local agencies do not require a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earthmoving on state or private land in a project site.

Regional

San Diego County Multi-Jurisdictional Hazard Mitigation Plan

In 2010, the City of Encinitas, along with the 18 other jurisdictions in San Diego County, adopted the Multi- Jurisdictional Hazard Mitigation Plan (MHMP). The MHMP identifies risks and ways to minimize damage by natural and manmade disasters throughout the county. It is a comprehensive document that includes creating a decision tool for management, promoting compliance with state and federal requirements, enhancing local policies for hazard mitigation capability, and providing interjurisdictional coordination. The City of Encinitas's specific hazard mitigation goals, objectives, and related potential actions for earthquake hazards are included in the MHMP (City of Encinitas 2019a).

Local

City of Encinitas General Plan

The City of Encinitas General Plan (General Plan) serves as a blueprint for the long-range physical planning of the City. The General Plan contains goals and a policies designed to shape the long-term development of the City, as well as protect its environmental, social cultural and economic resources. The relevant goals and policies for the project include:

Land Use Element

Policy 8.1:	Require that any improvement constructed in an area with a slope of more than 25% and other areas where soil stability is at issue to submit soils and geotechnical studies to the City for review and approval.

Resource Management Element

The following goal and policies are relevant in protecting cultural and paleontological resources in the City.

GOAL 7:	The City will make every effort to ensure significant scientific and cultural resources in the Planning Area are preserved for future generations (Coastal Act/30250).
Policy 7.1:	Require that paleontological, historical and archaeological resources in the planning area are documented, preserved or salvaged if threatened by new development (Coastal Act/30250).
Policy 7.2:	Conduct a survey to identify historic structures and archaeological/cultural sites throughout the community and ensure that every action is taken to ensure their preservation.
Policy 8.5:	The City will encourage the retention of the coastal bluffs in their natural state to minimize the geologic hazard and as a scenic resource. Construction of structures for bluff protection shall only be permitted when an existing principal structure is endangered and no other means of protection of that structure is possible. Only shoreline/bluff structures that will not further endanger adjacent properties shall be permitted as further defined by City coastal bluff regulations. Shoreline protective works, when approved, shall be aligned to minimize encroachment onto sandy beaches. Beach materials shall not be used as backfill material where retaining structures are approved. Approved devices protecting against marine waves shall be designed relative to a design wave, at least equal to 1982–83 winter storm waves.
GOAL 13:	Create a desirable, healthful, and comfortable environment for living while preserving Encinitas' unique natural resources by encouraging land use policies that will preserve the environment.

Policy 13.1:	The City shall plan for types and patterns of development which minimize water pollution, air pollution, fire hazard, soil erosion, silting, slide damage, flooding and severe hillside cutting and scarring.
GOAL 14:	The City shall stringently control erosion and sedimentation from land use and development to avoid environmental degradation of lagoons and other sensitive biological habitat, preserve public resources and avoid the costs of dealing with repair and sedimentation removal.
Policy 14.1:	The best strategy to reduce erosion and sedimentation is to reduce to the maximum extent feasible, grading and removal of vegetation. It is the policy of the City that, in any land use and development, grading and vegetation removal shall be limited to the minimum necessary.
Policy 14.3:	The City will reduce the rate of sedimentation of the lagoons by requiring procedures for controlling runoff and erosion associated with upland grading and development based on a minimum 10-year, six-hour storm event. The City shall provide regulations for the use of sedimentation basins and the potential transfer of sediment as beach replenishment (if of an acceptable material).
Policy 14.4:	Revegetation and appropriate landscaping of all areas graded and scraped of vegetative cover shall be required with land use and development. Plantings, hydroseeding, and irrigation systems used shall be selected on the bases of minimizing erosion and conserving water.
Policy 14.5:	To minimize erosion and allow sedimentation control systems to work, no grading or vegetation removal shall be allowed to occur during the wet season, October 1– April 15, without all systems and devices per an approved erosion control plan and program being in place. During other times of the year such systems shall be provided and operative as required by a comprehensive City erosion control ordinance. No grading shall occur during the rainy season within the Special Study Overlay area, or in areas upland of sensitive areas including lagoons, floodplains, riparian or wetland habitat areas, unless by site-specific determination, the grading would not be occurring on sensitive slopes, in floodplain areas or upland of floodplains, where sedimentation might occur in other sensitive habitat areas. Then, if grading is determined to be allowable, all necessary erosion control devices, including sedimentation basins, must be in place, and shall be monito red and maintained throughout the grading period.
Policy 14.6:	To achieve the ends of erosion control, a comprehensive erosion control plan shall be required with final building permit and improvement plans, subject to review and approval prior to commencement of grading and construction.
Policy 14.7:	Minimize extensive or premature grading or filling and penalize illegal grading or filling.

City of Encinitas Municipal Code

The City of Encinitas Grading, Erosion and Sediment Control Ordinance (Chapter 23.24) establishes minimum requirements for grading, excavating and filling of land. It also provides for the issuance of grading permits and provides for the enforcement of those requirements. This ordinance was adopted pursuant to, and to implement provisions of, the Encinitas General Plan and certified Local Coastal Program Land Use Plan (LUP). It is the City's intent to protect life and property, promote the general welfare; enhance and preserve the physical environment of the community; and maintain the natural scenic character of Encinitas.

- Section 23.24.140 requires that a grading plan be prepared and stamped by a civil engineer registered in the State of California. If a soils and geology report is required, the grading plan is required to be signed by a licensed soil engineer and a licensed engineering geologist.
- Sections 23.24.150 and 23.24.160 require an interim and final erosion and sediment control plan be included as part of the grading plan provided by a California registered civil engineer. The interim erosion control plan must be prepared with respect to conditions existing on the site during land disturbance or filling activities or soil storage. The final erosion control and sediment plan shall be provided with respect to the conditions existing on the site after final structures and improvements (except those required under this section) have been completed and where these final structures were not covered by an interim plan.
- Section 23.24.170 states that a soil engineering report, when one is required by the City Engineer, shall be prepared and certified by a licensed California soils engineer and shall be based on adequate and necessary test borings.
- Section 23.24.180 requires the preparation of an engineering geology report in addition to a soils report when the City Engineer determines that the proposed development is in an existing or a potential geologic hazardous area. A geological hazard area is an area subject to landslide, faulting, or other hazards as identified by the City Engineer. The report must be prepared by a licensed California engineering geologist and a licensed California civil engineer or geotechnical engineer and is required to be based on adequate and necessary test borings.

3.5.3. Thresholds for Determination of Significance

This section lists the thresholds used to conclude whether a geology and soils impact would be significant.

Guidelines for Determination of Significance

A project would be considered to have a significant impact if it would:

1) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving:

a) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

b) Strong seismic ground shaking.

c) Seismic-related ground failure, including liquefaction.

d) Landslides.

2) Result in substantial soil erosion or the loss of topsoil.

3) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

4) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

5) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

6) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Issues Not Discussed Further

As described in Chapter 2, Project Description, the proposed Project does not include the installation of a septic system or alternative wastewater treatment system. Therefore, the site's ability to support the use of septic tanks or alternative wastewater disposal systems is not analyzed further.

3.5.4. Analysis of Project Effects and Significance Determination

Impact 3.5-1a: Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving the rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

All of Southern California, including the Project site, is subject to seismic activity as a result of the active faults that traverse the region. As discussed in subsection 3.5.1, Existing Conditions, no known active faults transect or project toward the site, nor is the site located within an earthquake

fault zone mapped by the State or by the County of San Diego. The nearest fault is the Rose Canyon fault zone, approximately 2.5 miles west of the City of Encinitas at its closest point.

Because of the distance to the nearest fault and the magnitude of previous seismic activity, the proposed Project would neither negate nor supersede the requirements of the Alquist-Priolo Earthquake Fault Zoning Act, nor would the Project expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the current Alquist-Priolo Earthquake Fault Zoning Map. Even though no active faults traverse the Project site, all new development would have to comply with the requirements of the Alquist-Priolo Fault Zoning Act as well as the CBC. Therefore, impacts would be less than significant, and no mitigation would be required.

Impact 3.5-1b: Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving strong seismic ground shaking.

As discussed in Issue 1a, Southern California has numerous active seismic faults potentially subjecting people to earthquake- and seismic-related hazards. Seismic activity poses two types of potential hazards for people and structures, categorized as either primary or secondary hazards. Primary hazards include ground rupture, ground shaking, ground displacement, subsidence, and uplift from earth movement. Secondary hazards include ground failure (lurch cracking, lateral spreading, and slope failure), liquefaction, water waves (seiches), movement on nearby faults (sympathetic fault movement), dam failure, and fires. These secondary hazards are discussed in Impact 3.5-1c, below.

The Project site is in a seismically active region and could experience ground shaking associated with an earthquake along nearby faults, including the Rose Canyon fault zone, which is located 2.5 miles west of the City of Encinitas at its closest point and has the capability to generate a magnitude 6.2 to 7.2 earthquake that could potentially damage public and private structures and infrastructure throughout the city. A magnitude 6.9 earthquake on the Rose Canyon Fault has the potential to reach a peak ground acceleration of 0.40 within downtown Encinitas and the Coast Highway 101 corridor (City of Encinitas 2019).

Regardless of the seismic activity anticipated to occur on-site, the project would be designed in accordance with CBC requirements that address structural seismic safety. This would include design criteria for seismic loading and other geologic hazards. As discussed in Section 3.5.1, Existing Conditions, the CBC defined six different Seismic Design Categories. All of San Diego County, including the Project site, is in Seismic Design Category E or F (the most severe). Therefore, the proposed Project would be required to comply with the design requirements for Categories E and F. Specifically, the Project would be required to meet development design measures specific to Seismic Design Categories E and F intended to maximize structural stability in the event of an earthquake. The requirements of the CBC address structural seismic safety and include design criteria for seismic

loading and other geological hazards. This includes design criteria for geologically induced loading that governs structural member sizing, building supports and materials, and provide design process calculation methods. The CBC also includes provisions for buildings to structurally survive an earthquake without collapse as well as measures such as foundation anchors and structural frame design. Thus, while shaking impacts would be potentially damaging, they would also tend to be reduced in their structural effects due to CBC criteria that recognize this potential. The CBC includes provisions for buildings to structurally survive an earthquake without collapse and includes measures such as foundation anchors and structural frame design.

Project conformance with CBC and the specifications for Seismic Design Categories E and F, as well as local requirements relative to grading and construction would ensure that the Project does not result in exposure of people or structures to potentially substantial adverse effects involving strong seismic ground shaking. Therefore, impacts would be less than significant, and no mitigation would be required.

Impact 3.5-1 c: Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving seismic-related ground failure, including liquefaction.

Based on the historical and current depth to groundwater, the potential for liquefaction is very high at the Project site due to groundwater at a depth of 9 to 20 feet and existing alluvial soils. The liquefaction analysis included in the Geotechnical Report indicates that there is potential for liquefaction occurring within the layers of alluvium between the depths of 10 to 50 feet, and on-grade structures could experience about 7 to 11 inches of total liquefaction settlement during peak ground acceleration. The following project design features incorporated into the building plans in accordance with the CBC and as summarized within the Geotechnical Report, would reduce potential impacts associated with liquefaction, including the risk of life or injury due to local seismic events to an acceptable level of risk.

Project Design Features

The upper 30 feet of onsite alluvium would be remediated for liquefaction using specialized ground improvement techniques consisting of vibro replacement stone columns. The proposed installation of these columns would be sufficient to yield a 4-inch or less potential for settlement and a maximum dynamic differential settlement of 2.0 inches or less over 40 feet.

With these project design features, the impacts associated with liquefaction would be avoided and less than significant.

Impact 3.5-1d: Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving landslides.

Non-seismically induced landslides are often the result of water from rainfall, septic systems, landscaping, or other origins that infiltrate slopes with unstable material. According to the Geotechnical Report prepared for the Project (Appendix F-1), landslides and active faulting are not known to occur on the Project site. However, the report anticipated that graded fill slopes will be stable to heights of at least 30 feet if they are designed at ratios of 2:1 (horizontal: vertical) or flatter. This is assuming they are graded to the City of Encinitas design criteria and observed and tested by a qualified geotechnical consultant. The report anticipated that slopes cut in alluvium will not be surficially stable and, as such, would require replacement with a drained stabilization fill. Additionally, the report anticipated that slopes exposing bedrock Del Mar Formation or Torrey Sandstone Formation would likely be grossly and surficially stable at ratios of 2:1 (horizontal: vertical) or flatter. Assuming detailed grading recommendations would be developed when grading plans become available and that grading recommendations and liquefaction mitigation techniques would be coordinated, and all grading recommendations would conform to the City of Encinitas design criteria would reduce impacts involving landslides to less than significant levels, and no mitigation would be required.

Impact 3.5-2: Result in substantial soil erosion or the loss of topsoil.

Soil erosion has the potential to occur during construction of the proposed Project, as grading and construction can loosen surface soils and make them susceptible to the effects of wind and water movement across the surface. All construction activities related to the proposed Project would be required to comply with the CBC. Additionally, the proposed Project would be subject to compliance with the requirements set forth in the National Pollutant Discharge Elimination System (NPDES) Storm Water General Construction Permit (Order No. 2009-0009-DWQ) for construction activities and includes preparation and implementation of a SWPPP and BMPs. The SWPPP would be completed prior to project construction (discussed in further detail in Section 3.7, Hydrology and Water Quality, of this EIR).

Compliance with the CBC and the State General Construction Permit would minimize adverse effects from erosion and sedimentation and ensure consistency with San Diego Regional Water Quality Control Board requirements, which establish water quality standards for the groundwater and surface water of the region. The State General Permit also requires that construction contractors implementing SWPPPs have prerequisite qualifications that demonstrate the skills, knowledge, and experience necessary to implement those plans. The requirements of the NPDES would substantially reduce the potential for erosion or topsoil loss to occur in association with the proposed Project. Water quality features intended to reduce construction-related erosion impacts will be clearly noted on the grading plans for implementation by the construction contractor. Limiting certain construction activities to dry weather, covering exposed excavated dirt during periods of rain, and

protecting excavated areas from flooding with temporary berms would minimize the potential for erosion to occur. Additionally, implementation of the recommendations from the Geotechnical Report such as:

- Preparation of detailed grading recommendations should be developed when grading plans become available.
- Coordination of grading recommendations and liquefaction mitigation techniques.
- All grading recommendations should conform to the City of Encinitas criteria.
- If infiltration systems are required on this site, care should be taken in designing systems that control the storm water as much as possible.
- Import soils, if any are required, be low to very low in with negligible sulfate and chloride contents, as verified by appropriate laboratory testing.

Thus, the proposed Project would comply with required erosion and runoff control measures included as part of the approval of a grading plan. These factors, coupled with conformance to applicable federal, state, and local regulations, and implementation of appropriate BMPs means the proposed Project would not result in substantial soil erosion or the loss of topsoil. Impacts would be less than significant, and no mitigation would be required.

Impact 3.5-3: Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

As discussed in Impact 3.5-1c, based on the historical and current depth to groundwater, it has been determined that the potential for liquefaction is very high on the Project site. The results of the Geotechnical Report (Appendix F-1) indicate that as much as 7 to 11 inches of settlement is possible for the proposed Project during a seismic event (earthquake). According to the study, half to two-thirds of that settlement should be considered differential. Given the proposed grading concept that would result in a "free-face" fill slope along the site limits paralleling Manchester Avenue in the southern portions of the Project site, it is anticipated that there also is a high probability for lateral spread to occur.

The following project design features incorporated into the building plans in accordance with the CBC and as summarized within the Geotechnical Report, would reduce potential impacts associated with landslide, lateral spreading, subsidence, liquefaction or collapse to an acceptable level of risk.

Project Design Features

The upper 30 feet of onsite alluvium be remediated for liquefaction using specialized ground improvement techniques consisting of vibro replacement stone columns. The proposed installation

of these columns would yield a 4-inch or less potential for settlement and a maximum dynamic differential settlement of 2.0 inches or less over 40 feet.

With these project design features, the impacts associated with landslide, lateral spreading, subsidence, liquefaction or collapse would be less than significant. No mitigation would be required.

Impact 3.5-4: Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

The Geotechnical Report (Appendix F-1) determined that the alluvium consists of largely of sands, silty sands, sandy silts and clayey silts. Clays and silty clays become predominant in the central portion of the site below 40 feet below the ground surface. Consistencies in the sands range from "very loose" to "loose". Moistures range from slightly moist near the ground surface increasing to very moist to wet below groundwater surface. Thus, the expansion potential of the alluvium appears to be "very low" based on laboratory testing. Impacts under this criterion would therefore be less than significant, and no mitigation would be required.

Impact 3.5-5: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Direct impacts to a paleontological resource could result from grading, excavation, trenching, or other ground-disturbing activity that disrupts subsurface geologic formations and causes the destruction or alteration of a paleontological resource. Indirect impacts to paleontological resources are not specifically caused by development of a project, but rather may be a reasonably foreseeable result of such a project. An example of an indirect impact to paleontological resources could be the destruction or loss of surface fossils from increased erosion during or after completion of a project or the unauthorized tampering or removal of a fossil or paleontological resource from a project site. Actions that place material on top of existing surface areas, such as building up dikes or placement of material to level a surface, do not have the potential to adversely impact subsurface resources.

The majority of project-related ground-disturbing activities would occur within portions of the Project site that are generally underlain by alluvial deposits. Quaternary alluvial deposits in San Diego County are assigned low paleontological resource sensitivity because of their young age. This indicates a low potential for paleontological resources to be present within the Project area requiring excavation within the lagoon. Some other formations within the Project site have higher paleontological resource sensitivity ratings.

A considerable number of known paleontological resources have been identified in areas immediately adjacent to the San Elijo Lagoon, which indicates a potential for additional resources to be discovered within sensitive underlying formations.

For example, the highly sensitive Delmar Formation (Tt/Td) is located on the northern border of the Project site's area of disturbance (Figure 3.5-1, Geologic Formations). Excavation of any depth in this area would have the potential to impact paleontological resources. Thus, even shallow grading activities may disturb the underlying sensitive formation, resulting in a potential for paleontological resources to be damaged or destroyed. Grading within the Delmar Formation could destroy a unique paleontological resource or affect an area of underlying sensitive parent material with moderate to high sensitivity, and impacts are potentially significant. Mitigation Measure GEO-1 would be required to mitigate impacts. With the implementation of MM GEO-1, impacts under this criterion would be reduced to less than significant.

3.5.5. Mitigation Measures

Grading within the highly sensitive Delmar Formation could result in potentially significant impacts to paleontological resources. Other excavations would extend only into upper soil layers and are not anticipated to reach underlying bedrock formations where sensitive paleontological resources may exist. Mitigation measure GEO-1 will be required under CEQA for excavation/grading activities that occur within the Delmar Formation.

MM GEO-1 Paleontological Data Recovery and Monitoring Plan

Prior to grading permit issuance, during grading and excavation activities, and prior to building permit issuance, a Data Recovery and Monitoring Plan shall be prepared and implemented to the satisfaction of the City. The Plan shall document paleontological recovery methods and consist of the following measures, which shall be included on Project grading plans to the satisfaction of the City:

1. A monitoring program during grading, trenching, or other excavation into undisturbed substratum or deeper bedrock beneath the soil horizons and a fossil recovery program shall be implemented for excavation equal to or greater than 2,500 cubic yards (cy) in the Delmar Formation. A City-approved paleontologist shall be contracted to perform paleontological resource monitoring and a fossil recovery program.
2. If significant paleontological resources are encountered during grading, trenching, or other excavation into undisturbed rock layers of the Delmar Formation. The following shall be completed:
    a. A City-approved paleontologist shall perform the monitoring (and recovery, if necessary), and report preparation duties.
    b. A final Paleontological Resource Mitigation Report that documents the results, analysis, and conclusions of all phases of the Paleontological Monitoring Program shall be prepared, if excavation into the Delmar Formation occurs and monitoring is required.

Timing/Implementation:	*Prior to grading permit issuance, during grading and excavation activities, and prior to building permit issuance*
Enforcement/Monitoring:	*City of Encinitas Development Services*

Level of Significance After Mitigation

Implementation of mitigation measure MM GEO-1 would reduce impacts to below a level of significance.

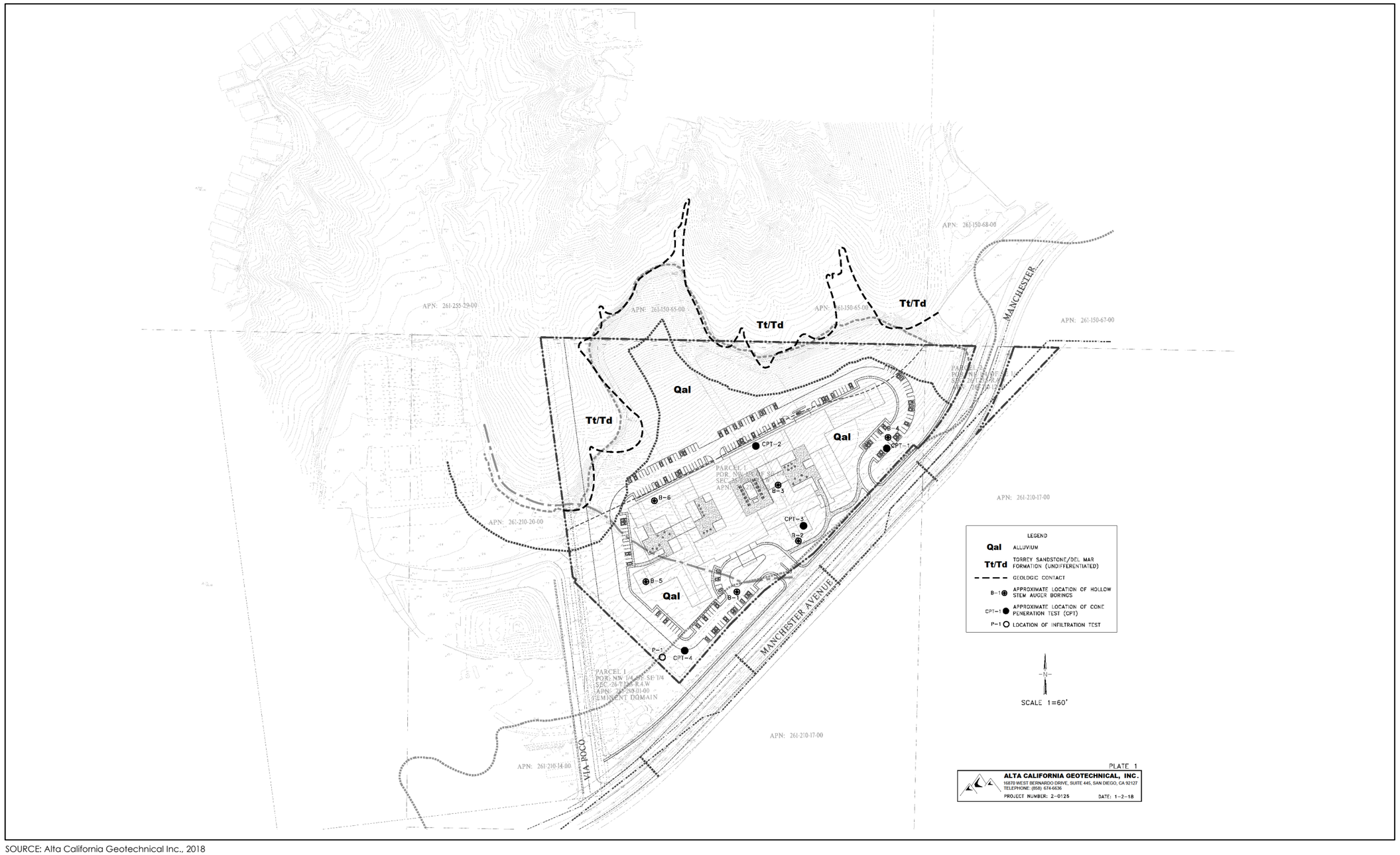
3.5.6. Cumulative Impact Analysis

The geographic scope for cumulative impacts to geology and soils includes the projects identified in Table 2-5 of this EIR. Impacts to geology and soils tend to be site-specific rather than cumulative in nature. Seismic events may damage or destroy a building on a project site, but the development of a project on one site would not cause any adjacent parcels to become more susceptible to seismic events. Similarly, a project cannot affect local geology in such a manner as to increase risks regionally. Impacts regarding surficial deposits, namely erosion and sediment deposition, however, can be cumulative in nature in a watershed.

Soils associated with the Project site are similar to other soils in the area. Site-specific conditions result in impacts associated with fault rupture and strong seismic ground shaking, seismic-related ground failure, including liquefaction and unstable soils, landslides, and shallow groundwater. These inherent conditions are the result of natural historical events that occur through vast periods of geologic time and are not based on cumulative development.

The proposed Project will require grading of portions of the Project site to allow for development of the proposed Project. It is expected that the Project and other area development will comply with the IBC, CBC, and the Encinitas Municipal Code. Thus, the proposed Project, when considered in combination with other past, present, and reasonably foreseeable projects within the vicinity, would not result in significant cumulative impacts. Accordingly, the Project's contribution to a significant cumulative geology and soils impact is less than cumulatively considerable.

No additional mitigation would be required.



SOURCE: Alta California Geotechnical Inc., 2018

BRG CONSULTING, INC.

Geologic Formations
Belmont Village Encinitas-by-the-Sea
Figure 3.5-1

This page intentionally left blank.